SIGNALS AND SYSTEMS

1. What is SIGNALS AND CLASSIFICATION OF SIGNALS?

Ans. A signal is a function representing a physical quantity or variable, and typically it contains information about the behavior or nature of the phenomenon. For instance, in a RC circuit the signal may represent the voltage across the capacitor or the current flowing in the resistor. Mathematically, a signal is represented as a function of an independent variable t. Usually t represents time. Thus, a signal is denoted by x(t).

2. What are the Properties of the Convolution Integral?

Ans. The convolution integral has the following properties.

I. Commutative:

$$\sim (t^* h)(t) = h(t)^* \sim (t)$$

2. Associative:

$$\{x P)^* h l (4^* h, (t) = x(t)^* \{h l (f^*) h 2 (4)$$

3. Distributive:

$$x(t)^* \{h, (t)) + h N = x(t)^* h l (t) + x(t)^* h, (t)$$

3. What are *Causal and Stable Systems?*

Ans. If the system is both causal and stable, then all the poles of H(s) must lie in the left half of the s-plane; that is, they all have negative real parts because the ROC is of the form Re(s) >a max, and since the jo axis is included in the ROC, we must have a,, < 0.

4. Define Z-Transform?

Ans. The function H(z) in Eq. (4.2) is referred to as the z-transform of h[n]. For a general discrete-time signal x[n], the z-transform X(z) is defined as

m

X(Z)= x[n] z - "

n= -OD

(4 . 3)

The variable z is generally complex-valued and is expressed in polar form as where ***r*** is the magnitude of ***z*** and R is the angle of ***z .*** The z-transform defined in is often called the bilateral (or ***two-sided)*** z-transform in contrast to the unilateral.

5. Define impulse response of a DT system.

Ans. The impulse response is the output produced by DT system when unit impulse is applied at the input. The impulse response is denoted by h(n). The impulse response h(n) is obtained by taking inverse Z transform from the transfer function H(z)

6. State Sampling theorem.?

Ans. A band limited signal of finite energy, which has no frequency components higher than the W hertz, is completely described by specifying the values of the signal at the instant of time separated by 1/2W seconds and

A band limited signal of finite energy, which has no frequency components higher than the W hertz, is completely recovered from the knowledge of its samples taken at the rate of 2W samples per second.

7. What are the Properties of ROC.?

Ans.

i. The ROC of a finite duration sequence includes the entire z- plane, except z= 0 and $|z|=\infty$.
ii. ROC does not contain any poles.
iii. ROC is the ring in the z-plane centered about origin.
iv. ROC of causal sequence (right handed sequence) is of the form $|z| > r$.
v. ROC of left handed sequence is of the form $|z| < r$.
vi. ROC of two sided sequence is the concentric ring in the z plane

8. State convolution property of Z transform?

Ans. The convolution property states that if

x1[n]
X1(Z) and
x2[n]
X2(Z) then
x1[n] *x2[n]

X1(Z) X2(Z)

That is convolution of two sequences in time domain is equivalent to multiplication of their Z transforms